Socioecological diversity and inclusion: a framework for advancing diversity science

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Understanding environmental influences on group processes has been a foundational goal of groups research since its inception. The aim of this paper is to synthesize recent research on the social ecology of diversity and inclusion. In doing so, we suggest a socioecological framework for examining how facets of the natural and social environment shape important intragroup and intergroup outcomes. Socioecological diversity reflects the distribution of social groups within a particular environment, including demographic composition, relative representation, and segregation. Socioecological inclusion refers to cues embedded in the environment that signal a social group's inclusion or exclusion in a given setting. These include cues embedded in the physical environment (physical cues), political environment (policies, practices, and rhetoric), and social environment (aggregated attitudes).

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In the 1940s when the Clarks studied the development of black children's racial attitudes, they included one of the most defining ecological moderators in the United States at that time: regional differences in legalized segregation [1]. Shortly thereafter, much of Theodor Adorno's research on the origins of prejudice and the authoritarian personality was dedicated to understanding the effects of war, another powerful ecological influence [2]. During the nascent development of social psychology, researchers exploring group phenomena understood the importance of studying the dynamic interplay between human behavior and physical and social environments. Over time, the study of ecological forces in group research waned, until a recent revival of interest.

The purpose of this review is to synthesize recent research in psychology and other fields examining the social ecology of diversity and inclusion. We offer a unified socioecological framework for examining how different facets of the environment contribute to the creation, interpretation, and maintenance of group differences, and the consequences of these distinctions [3]. We identify (1) *socioecological diversity* and (2) *socioecological inclusion* as related but distinct aspects of the natural and social environment that shape important intragroup and intergroup outcomes. We then highlight the reciprocal way in which socioecological diversity and inclusion influence one another. In such a short review, our goal is not to provide an exhaustive overview of studies and concepts underpinning socioecological diversity and inclusion, but rather to provide illustrative examples of the types of psychological insight such a framework can provide.

Socioecological diversity
We define socioecological diversity as the distribution of social groups among individuals in a given environment with respect to a particular attribute, such as race, ethnicity, gender, political ideology, religion, socioeconomic status, and sexual orientation [4]. Socioecological diversity thus reflects an environment's demographic profile, including both the degree to which people with certain attributes are present in absolute or relative terms and where these individuals are located in physical or social space. Socioecological diversity is a property of the environment as a whole, whether a physical environment, such as a city, or a social environment, such as a social media network. Studies of socioecological diversity examine how the demographic profile of physical and social environments affects the human mind, cognition, and behavior, and how particular psychological states (e.g., perceived discrimination) give rise to the establishment and maintenance of certain demographic profiles. We outline three components of socioecological diversity below: demographic composition, relative representation, and segregation.

Demographic composition
When examining actual, rather than perceived, diversity, psychologists commonly operationalize diversity as demographic composition: the quantity of groups and/or group members present in a particular environment.

Three different types of measures of demographic composition are the number of social groups present (e.g., number of ethnic groups in a city), the relative number of individuals belonging to a particular social group (e.g., percentage of Black residents in a state, proportion of outgroup members in a social network), and indices of heterogeneity that relay how evenly distributed individuals are across categories by taking into account both the number of groups present and the relative share of individuals within each group (e.g., Simpson's D [5]). Though demographic composition is sometimes viewed as synonymous to diversity, we suggest instead that demographic composition is but one part of the broader demographic profile that makes up socioecological diversity.

Much research has examined the relationship between the demographic composition of groups, cognitive processes, and performance, generally finding that compositional diversity is associated with positive cognitive processes (e.g., complex thinking, accuracy, problem solving [6–9]) and mixed overall performance effects [10–13]. Other work suggests that demographic composition is associated with intergroup attitudes, belonging, physiological vigilance, threat, evaluative processes, and quality of life [14–18]. One recent breakthrough has been in the area of demographic composition and trust. Some prior research suggested that individuals are less trusting in demographically heterogenous regions [19], providing a grim outlook for the future as global exchange increases. However, new findings from data on the religious composition of 68 countries over 22 years suggest that, although compositional diversity is associated with reduced trust and quality of life in the short term, these effects dissipate over time as compositional diversity provides opportunities for increased intergroup contact [20••]. The ability to make causal inferences about the effects of demographic composition is rare. However, an innovative experiment randomly assigning outgroup individuals to appear in the daily lives of commuters [21] and a natural experiment examining the effect of removing a neighboring group of outgroup members [22] suggest that demographic composition causally influences psychological outcomes, such as political attitudes and behavior.

Demographic relative representation
The demographic composition of a particular focal environment *relative to that of the broader community or population* can have unique psychological effects [23••,24–26]. Demographic relative representation captures the degree of alignment between the demographic composition of the focal setting and that of its macroenvironment [23••]. In a study of United Kingdom hospital workers, King and colleagues found that underrepresentation of one's ethnic minority group in the workplace relative to the broader community in which the hospital was located was associated with lower job satisfaction and greater turnover intentions among ethnic minority staff [23••]. Moreover, patients perceived a greater level of respect and civility when hospital employees were more ethnically representative of the broader local community, regardless of the absolute demographic composition of the staff [24].

Though research on demographic relative representation comprises a small proportion of studies on diversity, national trends in relative representation suggest that this will be a fruitful area of study. For example, sociologists have documented growing racial incongruence between schools and neighborhoods in the U.S., where increasingly fewer white students enroll in local public schools relative to the proportion of whites in the surrounding neighborhoods as white parents choose to send their children to other schools [27]. The psychological effects of such trends have yet to be examined, but serve as generative avenues for future research.

Demographic segregation
Demographic segregation describes how social groups and their members are interspersed relative to one another within a particular physical or social space. The psychological effects of demographic composition (e.g., ethnic heterogeneity) can differ dramatically depending on whether the groups are integrated or segregated, and degree of segregation can help account for inconsistent findings regarding the relationship between demographic composition and intergroup relations [17,28,29]. Segregation is thus a key variable for future systematic investigation in socioecological psychology. Recent research suggests that even with no change in overall demographic composition or contact between groups, the degree to which groups are segregated can increase intergroup bias [30•]. Both physical segregation (e.g., a dissimilarity index of residential segregation) and social segregation (e.g., patterns of contact occurring mostly between members of the same group in social networks [31]) can lead to increased intergroup tension [28]. Mechanisms through which segregation increases bias and tension may include heightening stereotyping by serving as a heuristic for intergroup difference, reducing contact, and promoting differentiation in preferences and culture [28].

Socioecological inclusion
Psychologists tend to conceptualize diversity as a socioecological variable. By contrast, inclusion is often thought of as a function of people's perceptions, attitudes, and interpersonal interactions. The extent that any one member of a social group will feel included in a particular environment—for example, feel welcomed, accepted, and like they belong—certainly depends on the individual's characteristics and experiences [32]. However, a rich body of literature shows that these feelings of group-based inclusion are also sensitive to

and dependent on cues embedded in the natural and social environment [33].

Building on this literature [33], we suggest that socio-ecological inclusion can be conceptualized as the environmental cues that signal a social group's inclusion or exclusion in a given setting—that is, cues that convey the degree to which particular social groups are welcomed, are accepted, and belong in that setting. Socio-ecological inclusion cues may be built into the environment intentionally or unintentionally. Just as socioecological diversity is a property of the environment, so too is socioecological inclusion, and both work together at the ecological level to influence intragroup and inter-group outcomes. Importantly, socioecological inclusion is distinct from diversity. Whereas socioecological diversity is primarily a characteristic of the interpersonal environment, socioecological inclusion spans a wider array of environments [34], including (but not limited to) physical, political, and social environments. Here, we give examples of socioecological inclusion cues for each of these three environments.

Physical environment: physical cues and symbols

Cues in the physical environment can signal both inclusion and exclusion to social group members. Symbolic representations of particular social groups (e.g., representations of Christians such as Christmas displays and wall-hung crosses) can simultaneously boost feelings of inclusion among members of those groups (e.g., Christians) and reduce feelings of inclusion among non-members (e.g., Buddhists and Sikhs [35]). In doing so, these symbols can enhance ingroup wellbeing while harming out-group wellbeing [35,36]—even when neither group expects such displays to have any effect on them.

Similarly, exposure to stereotypic representations of one's social group can harm members of underrepresented or stigmatized groups, whereas exposure to counterstereotypic representations of one's group can boost outcomes. For example, girls exposed to gender-stereotypic toys (Barbies) and American Indian students exposed to stereotypic portrayals of American Indians (sports mascots) had more constrained expectations for their future than their counterparts exposed to counterstereotypic representations [37,38]. Even physical cues that might otherwise be neutral can be imbued with psychologically inclusive or exclusive meaning in contexts where stereotypes are prevalent. For example, objects such as Star Trek posters and computer parts, which may normally appeal to either men or women, can broadcast masculine stereotypes when displayed in computer science settings, discouraging belonging, interest, and expected success in computer science among women, with no effects on their male counterparts [39–41].

Political environment: policy, practice, and rhetoric

Local or regional policies that signal inclusion or exclusion to particular social groups are associated with profound psychological consequences. For example, in the U.S., lesbian, gay, and bisexual (LGB) individuals living in states that banned gay marriage were significantly more likely to be diagnosed with psychiatric disorders than straight individuals in the same states and LGB individuals living in states without these bans [42]. Moreover, school antibullying and antidiscrimination policies specifically protecting LGB students were associated with reduced suicide rates among LGB teens, even after adjusting for risk factors [43].

Importantly, such policies do not only affect the psychology of the group targeted by the legislation, but also the psychology of those who interact with them. For example, human resources professionals in regions without sexual orientation antidiscrimination laws rated gay applicants as less hireable than nongay applicants and had greater prejudice toward gay men (even after controlling for political and religious views) compared to professionals in comparable regions with antidiscrimination laws [44]. An experimental manipulation of beliefs that the region had (versus did not have) antidiscrimination laws reduced interviewers' interpersonal discrimination when interviewing LGB confederate job applicants, suggesting a causal effect of policy on behavior [45].

In addition to official policy, exclusive political rhetoric may increase psychosocial stress among targeted groups, harming health. For example, two studies have suggested that anti-immigrant rhetoric during the 2016 U.S. Presidential election may have been associated with increased maternal stress and pre-term birth among Latina women [46[\bullet],47]. However, more research is needed in this area, especially work directly assessing psychological mechanisms.

Social environment: aggregated attitudes

In addition to thinking about attitudes at an individual level (e.g., one person's racial bias), researchers have also begun to examine the effects of attitudes aggregated across broad physical and social environments (e.g., the average racial bias of people in a particular region). Emergent evidence suggests that the attitudes of many may aggregate to form broader social climates that can cue inclusion or exclusion, with unique ecological effects on people in those environments beyond any specific interpersonal interaction. For example, regional anti-Black/pro-White bias in the U.S. is associated with health disparities between Blacks and Whites, such as death from circulatory disease [48] and infant health outcomes [49], disproportionate use of lethal force by police against Black people [50], and disciplinary disparities between Black and White students [51[\bullet]]. Moreover, recent analyses demonstrating that geographically aggregated bias is

a stable, coherent regional construct with meaningful contextual effects [52••] support the validity of conceptualizing aggregated intergroup attitudes as a property of interpersonal environments. Though much work remains to be done in this area, research on other forms of aggregated attitudes similarly suggest that collective attitudes can cue inclusion or exclusion, with important contextual effects. For example, academics' beliefs that raw, innate talent is needed for success, averaged nationally by discipline, predict underrepresentation of women and African Americans in each discipline [53].

Dynamic interplay between socioecological diversity and inclusion

By distinguishing socioecological diversity from socioecological inclusion, research and theory can begin to illuminate the dynamic interplay between them. An environment's demographic profile can influence the inclusion cues built into that environment and, simultaneously, cues conveying acceptance and belonging can shape the demographic profile of that environment. First, socioecological diversity can influence socioecological inclusion cues. In one study [54], the racial composition of schools was associated with the types of signs and images displayed for Black History Month. Majority-black schools displayed signage emphasizing historical racism (e.g., the struggle for Civil Rights legislation) while majority-White schools displayed signage emphasizing more generic cultural diversity. In turn, these displays had differential psychological effects: People randomly assigned to view the displays from majority-Black schools perceived greater racism in society and were more supportive of anti-racism policies than those who viewed the majority-White school displays.

Socioecological inclusion can also influence socioecological diversity. For example, partisans in the U.S. use cues in residential areas, such as the prevalence of hybrid cars, organic food stores, and bookstores versus pickup trucks, big box stores, and gun stores, to assess area politics and how much they will belong [55]. In turn, partisans may seek out neighborhoods with cues consistent with their own ideology, producing and reinforcing physical and social political segregation.

Additionally, socioecological diversity and inclusion can overlap; for example, socioecological diversity can itself function as a socioecological inclusion cue. In one study, women exposed to a math, science, and engineering conference with three male attendees to every one woman experienced lower belonging, less desire to participate in the conference, and greater physiological vigilance than women exposed to the same conference with a balanced gender ratio [18]. Here, the gender composition of the environment also functioned as an inclusion cue.

Concluding comments

Studying diversity and inclusion at the socioecological level presents challenges. Determining the proper level of aggregation for socioecological measures can be complicated; prior work has produced contradictory findings in how demographic composition affects intergroup attitudes depending on whether composition is operationalized at the census tract, zip code, neighborhood, or city level [56]. Moreover, selection bias in physical and social habitats must be accounted for [57]. Nonetheless, research on the social ecology of diversity and inclusion is burgeoning, revealing important insights into how natural and social environments shape real-world intragroup and intergroup attitudes, behavior, and outcomes. In the words of Morton Deutsch and Robert Krauss in 1965, "Often the light is brighter and the vision is clearer in the laboratory; yet, the remarkable things that people do as participants in laboratory experiments, to be seen in perspective, must be viewed from the outside [in natural settings]. Knowledge must be sought even where the obstacles are considerable and the light is dim, if social psychologists are to contribute to an understanding of the human problems of their time" [58]. The same can be said today when advancing the science of diversity and inclusion.

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